COAL MINING AT CANMORE

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H. M. HUNTER

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COAL MINING AT CANMORE.

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1926
Prize Essay.

COAL-MINING AT CANMORE.

Canmore is a small coal-mining town situated in the Bow River Valley about sixteen miles south-east of Banff and 76 miles west of Calgary. It is on the main line of the Canadian Pacific Railway, and the mines at Canmore have supplied the railway with fuel for its locomotives for nearly thirty years.

Coal mining first began in the valley when the railway was built. One of the first mines was started in 1890 at Anthracite, about five miles east of Banff. At this mine a considerable amount of hard-coal was extracted, but the mine had to be abandoned in 1904, the company having worked to the limits of its leases, and was unable to secure mining rights on the adjoining property. The Cochrane mine was opened up in 1888, but very little is known about it, for it was abandoned nearly thirty years ago. It was located about a mile north west of the present town of Canmore, and on the west side of the river. A railway spur was built to it from the Canmore station, which was then a divisional point on the railway. No. 1. Mine at Canmore was begun about 1891, and it was abandoned about 1914. This mine was located in the town and also the west side of the Bow river.

The Bankhead mine was begun about 1900 and operated until 1922. It was located about five miles north west of Anthracite. In 1906 No. 2. mine at Canmore was started, it being located about a mile south east of No. 1. In 1913 a mine was started about three miles north west of Canmore, which was known as the Georgetown mine. It only operated until 1918.

Of all these mines which at one time operated in the valley, No.2. Mine at Canmore is the only one which operates at the present time, and this report will deal mainly with it, although some reference will be made to the structure which was encountered in No.1. Mine.

GEOLOGY.

All the mines in the valley operated in the same geological horizon, namely the Kootenay formation of the Cretaceous Period. It is believed that different seams have been mined in most of the mines, although no direct corelation has been made, except between the two at Canmore. The coal from each mine has varied; Anthracite and Bankhead coals showed some similarity, but were not identical. The Canmore coal was quite different from either of the above coals, and as a matter pf fact, the coal now mined at Canmore is quite different from that of No.1.Mine.

Reference to geological maps (See fig.1.) shows the coal bearing measures at Canmore to exist as a long narrow band, not more than a mile wide, and extending the full length of the Canmore sheet. The district is called the "Cascade Coal Basin", and is probably over forty miles long, extending from beyond the Kananaskis river on the south east, to a point about ten miles up the Cascade river. Dr. D. B. Dowling gave a thickness of 2800 feet to this formation.

In order to gain a proper understanding of the structure of the Coal basin, it will be necessary to consider the cross section of the map area. (fig. 1 and 2.) Three large faults occur in this area, having a north westerly strike, and each paralleling a mountain range, in fact being the causes of the ranges themselves. The Laramide revolution, which brought about the building of the Rocky Mountains, seems to have been marked by a great pressure from the south west. This pressure produced a structure in this district of long narrow fracture

blocks resting against one another, and having a dip towards the south west. In some cases there is evidence of overlapping and this suggests that the mountain building progressed from the east towards the west. A simple conception of this can be gained by likening the structure to shore pressed ice when fractured; the outer cakes pushed on top of those nearer shore.

If there had been no subsequent erosion, each of these blocks would have been crowned on the westward sloping side with the youngest rocks in the original crust. However these rocks were comparatively soft and hence easily eroded, so that at present only small remnants of these younger rocks remain. The harder beds, such as the Carboniferous and Devonian limestones, were not eroded to the same extent, and today show up strongly forming the peaks and cliffs on the south west side of the Bow Valley. The remnants of the younger beds, in this case the Cretaceous, are only found in the wider and lower valleys, and in every case rest up against the next succeeding fault block. The result of the mountain building and the erosion which followed, is the exposure of many formations of rocks, which otherwise would have been buried deeply. The following is a list of the formations exposed in the valley.

Cretaceous Period.

1. Upper Ribboned Sandstone.

   This is the youngest formation exposed in the valley. The upper part of it has been entirely eroded, the remainder is found as a narrow band next to the succeeding fault block, and overlying the coal measures.

It consists of beds of sandstone and shale. Its greatest remaining thickness is 550 feet.

11. Kootenay Coal Measures.

This formation has a thickness of 2800 feet, and consists of sandstones and shales containing many valuable coal seams. In very few places has the upper portion of this formation escaped erosion.

111. Lower Ribboned Sandstone.

This series of beds is very similar to the formation which is found above the Coal measures, consisting of sandstones and shales, but not containing coal. It has a thickness at Canmore of about 1000 feet.

Jurassic Period.

Fernie Shale.

This formation consists of black marine shales with thin beds of grey sandstone. Its average thickness is 1600 feet.

Lower Triassic Period.

Upper Banff shale.

The top 100 feet of this formation is a dolometic limestone; the remainder is a reddish brown shale verging to a fine grained sandstone at the base. The thickness is 1200 feet.

Carboniferous Period.

Pennsylvanian.

Rocky Mountain Quartzite.

This is a fine grained sandstone nearly white in color. It has a thickness of 1600 feet.

Mississippian.

1. Upper Banff Limestone.

This is a bluish-white limestone with thin beds of shale near the top. It is quite often fossiliferous. Its thickness varies from 2500 to 3000 feet.

11. Lower Banff Shale.

This is a dark shale containing thin beds of limestone. The thickness of the formation is from 1000 to 1500 feet.

Devonian Period.

1. Lower Banff Limestone.

This is a massive, evenly bedded limestone, weathering in bold cliffs. Its thickness is 2000 feet.

11. Intermediate Limestones.

This is a brownish dolometic limestone. Its thickness is 1200 feet.

Cambrian.

Castle Mountain Group.

This formation is not exposed in the Cascade coal basin but is supposed to lie directly beneath the Intermediate limestones. These rocks are exposed on the Panther river about 30 miles North west of Canmore and consist of shaly limestones with traces of copper ores.

From consideration of the cross-section of the valley, it is seen that the coal measures should have a general south-westerly dip, until cut off by the fault. This is found to be the case, although there are some remarkable variations to this rule which will be considered later.

Mining Operations.

Before beginning a discussion of the actual mining, I think it will be necessary to define several terms which I shall be using frequently. (See fig.8.)

A gangway is driven practically horizontally in the seam, and because of this it marks a contour of the seam. As a matter of fact, it is driven on a slight rising grade, about $\frac{1}{2}$ of 1% to facilitate drainage and haulage. It acts both as a main haulage way and as a main airway.

A monkey, or counter-gangway is driven parallel to the gangway about fifty feet up the pitch. It serves as the return airway during development work.

A tunnel is driven through rock horizontally and may connect two seams or different parts of the same seam.

A slope is driven downwards in an inclined seam. It may be driven from the surface or from a gangway. It may be driven on the dip or at an angle to it.

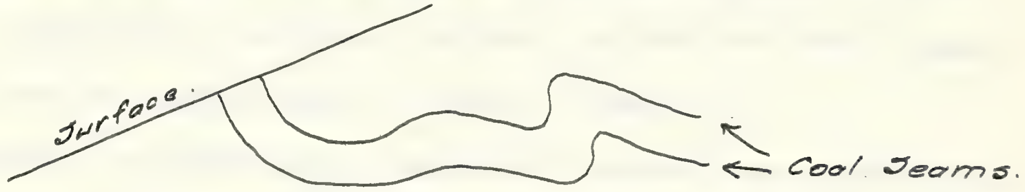
A Jig is driven upwards in an inclined seam from a gangway, and may also be driven on the dip or at an angle to it.

Breasts or cross-cuts are horizontal places driven from Slopes and Jigs on the strike of the seam. They generally parallel the gangway. The breasts on one side of a slope or jig are given the even numbers and those on the other side are given the odd numbers.

A pitch is a place which is driven between breasts, usually driven up the pitch. It also connects a gangway with its monkey gangway.

No.1. Mine was begun in the valley of a small creek near the town. In this valley the outcrops of several seams were exposed and entrance was made on the lowest, called No. 2. seam, by means of a slope. At the surface the measures dipped about 50° towards the south west, and from surface indications this dip appeared uniform. The slope was driven to a depth of about 600 feet and at this point two gangways were driven, one to the north west and the other to the south ~~west~~ east. Unfortunately surface indications did not give the correct idea of the trend of the measures, and as the mine progress it was found that several folds had occurred.

This prevented the mine expanding to the full width of the coal measures, and forced the mining operations to be confined to a long narrow area running parallel to the valley.



Underground connections were made with the other seams, and some of these were worked. The following is a list of these seams.

No. 6. Seam.

This is the highest seam which was known. It consisted of 4'6" of coal with one thin shale parting. Very little coal was taken from this seam.

No. 5. Seam.

This seam was 245 feet below No. 6. It consisted of 5'3" of soft broken coal.

No.4. Seam.

This seam was from 30 to 100 feet below No.5. and consisted of 3' 1" of clean bright coal.

No.1. Seam.

This seam was about 25 feet below No. 4. Seam. It consisted of 5'-8" coal with 8" of slate.

No.3. Seam.

This seam was 40 feet below No.1. and consisted of 5' of coal.

No.2. Seam.

This seam was 15 feet below No.3. and was the lowest mined. It consisted of 4' of coal.

All the above seams showed considerable irregularity both in thickness and quality of coal. This irregularity was most pronounced in No.5. and the seam finally seemed to pinch out altogether as mining progressed S.E. In its place a new seam appeared, about 30' below No.6. and was called the Carey seam. The Carey seam was mined about a mile to the S.E.

As part of the workings progressed towards the north west, the abandoned workings of the old Cochrane mine menaced them, since they were filled with water and no plans were in existence. Finally faulted ground was struck and no effort was made to push through.

The South East workings extended for over a mile and were connected with No.2. Mine by a tunnel. No.2.Mine had by this time become the larger of the two, so the surface plant at No.1. was pulled down and the available coal removed by means of the new tunnel. Finally in 1918 a concrete dam was placed in this tunnel and No.1. Mine allowed to fill with water.

No. 1. Mine produced a grade of coal which was classed as semi-anthracite running over 80% in fixed carbon. The daily

production was not large, probably not more than 300 tons a day. I mention this mine not because of its own importance, but in order to show its connection with the one now operating. It was quite gassy in spots and safety lamps were used throughout.

This mine has now passed into history and though plans are in existence, they are not very intelligible to the uninitiated, nor is their accuracy up to the present standards. The main source of information about this mine is the present Mine Manager, Mr. William Musgrove, who began in No.1. Mine as a track layer nearly thirty years ago.

No.2.MINE.

This mine was begun in 1905, entry being made by means of a slope in the Sedlock seam. Subsequent operations have developed workings in three seams; the lowest being the Carey, the middle one the Sedlock or Morris seam, and the highest the Stewart seam. The Sedlock seam is 300 feet above the Carey, and the Stewart is from 150' to 80' above the Sedlock.

The mine may be divided into two geological districts; the first extending from the mouth of the mine south eastwards to the Stewart fault, a distance of about a mile; and the second extending eastward from the Stewart fault to the limits of the workings.

The western district is characterized by two synclines and two anticlines (see figs. 4, 5 and 6), the crests and troughs of which dip towards the south east at varying rates. The centre anticline gradually flattens out and at or near the Stewart fault entirely disappears. The entry to the mine was made by a slope, now called the main slope, to the bottom of the basin in the Sedlock shown to the left in the cross section. From the bottom of this slope workings extended eastwards for a mile. As the centre anticline flattened out the workings proceeded around it and some coal was taken out of the other syncline, just west of the Stewart fault. Unfortunately the seam deteriorated as work progressed eastward and when the Stewart fault was struck in 1914 or '15 the W.H.MacNeil Company sold out for the proverbial song. At entry the coal was of good quality, the cross section of the seam being as follows;-

Coal	0' - 5"
Slate	0' - 2"
Coal	4' - 6"
Mining	0' - 1"
Total	5' - 6".

At the Stewart fault the seam was not over 4' in thickness and contained over 2' of slate. This area was so poor that no attempt has ever been made to withdraw the pillars. As a point of interest I may note that though blocked out over ten years ago, these rooms are still standing in as good condition as when they were abandoned.

In the meantime No.2. Tunnel was driven from the bottom of the main slope through the anticline separating the two synclines, and encountering both No.6. and the Carey seams on the same leg of the anticline. No.6. seam was prospected slightly here, but was never worked. In the Carey seam a gangway was driven in each direction from the Tunnel. The West gangway was driven about 600 feet and was finally stopped, being in coal very nearly vertical. The East gangway at nearly an equal distance rounded the crest of the plunging anticline, and proceeded in the opposite direction for nearly 1500 feet, the coal dipping to S.W. 20° It finally rounded the syncline and proceeded again in the south east direction running in coal nearly vertical, and was stopped when the coal pinched out at a drivage of over a mile. No.7. Tunnel was driven through the anticline parallel to No.2. to facilitate haulage. No.1. Slope was driven down to the bottom of the second syncline and workings progressed towards the east. At present the workings are in the basin under the main slope of the mine, and in the district of the Stewart fault. A rock slope 900 feet long dipping 20° degrees, has been driven from

near the bottom of the main slope to the Carey in the basin beneath, for haulage and ventilation. At present in one spot they have pushed through the Stewart fault and have just begun working in the east district in this seam.

When the workings reached the bottom of the second basin, a comparison of the plans of the two mines led them to believe that the workings of No.1. mine lay on the south west leg of the second anticline. To connect the two mines No.3. Tunnel north was driven through the anticline from the bottom of No.1. slope. On the completion of this tunnel the surface plant at No.1. was torn down. When the available coal from No.1. mine had been removed the tunnel was sealed by a dam, and later, for safety, a second dam was built. These two dams now hold back 300 feet of head of water.

When the MacNeil Company sold out to the Canmore Coal Coy. the new company by means of diamond drilling located a new seam which is called the Stewart, 156 feet above the Sedlock. The Stewart Tunnel was immediately driven through the Stewart fault to the new seam. The Stewart seam at this point consisted of 7 feet of clean coal, which was a bonanza to the company all during the war.

From this fault eastward I have considered the measures to constitute the East district. This district is characterized by the appearance of only one anticline and one syncline. The anticline is the continuation of the one which separated No.1.mine from No.2. in the west district, the central anticline having entirely disappeared. The crest and trough of the anticline and syncline dip towards the south east, in the same manner as in the west district. From the outcrop of the measures in this

district the seams dip to the S.W. at about 12° for over 2000 feet when they suddenly become vertical rising 500 feet. They again turn over and proceed for about 600 feet on an even dip of 15°. At this point another vertical area was encountered rising 40 feet, and again resuming the normal dip for 300 feet. Then a sudden drop is encountered, the extent of which has not yet been determined.

Three transverse faults have been encountered in this area besides the one already mentioned as the Stewart fault. Without exception they are all normal downthrow faults, The amount of throw varies in any single fault growing gradually less as it approaches the vertical measures.

In the Stewart seam work has progressed to the east, for over a mile. The area is mined by two gangways and connecting slopes and jigs. The vertical measures have been mined to a small extent, but turn out such a large proportion of fine coal that at present they are discontinued. Also the remnant of the seam which has been left overlying the west district, just west of the Stewart fault, has been mined.

As I have already mentioned the Stewart seam was originally composed of 7 feet of clean coal, but as the workings progressed eastward the seam deteriorated.

At the eastern limit of the present workings it is not over 4' in thickness and has a band of rock about a foot thick. The result is that development work in the Stewart has practically ceased, and though the bulk of the mine's output comes from this seam, it is mainly pillar work.

At a point 3600 feet east of the Stewart fault on No.1. gangway a tunnel has been driven connecting the Sedlock with the Stewart. In this area the Sedlock is known as the Morris. Twelve hundred feet still farther east but on No.2. gangway another tunnel has been driven connecting the two seams. The Morris has only been mined for the last three or four years, and workings have only progressed on 12° slope of the measures. The seam is about 8 feet high and contains from 2' to 6" of slate. Contrary to the other seams, it appears to get better as the workings progress eastward, and at present the development work is being centred in this seam.

This I think will conclude my description of the mine workings, and I will proceed on with the actual conditions of operation. However, I think it is well to note, that the stratigraphic relations of the seams in both districts ~~has~~ have been very difficult to work out, and ~~has~~ have been only definitely proved by the actual underground workings. The main difficulty has been that the surface is covered with alluvial gravel from 20 to 60 feet deep, and in very few instances are any of the rocks exposed. This has reduced surface prospecting to a minimum and that has to be carried on mainly by expensive drilling operations.

MINING OPERATIONS.

The mine is as one would note quite an extensive one, and the working conditions vary so greatly that it is impossible to describe accurately the actual operating conditions without making the report too bulky.

In fig.7. I have shown the plan which is followed in blocking out pillars when the pitch of the seam is as high as 30°. I might mention that none of the seams ~~is as high~~ at present have any flat workings. The method could be called the gangway-slope method. A gangway, with its monkey for ventilation, is driven in the seam and the gangway constitutes the main haulage way for its district. Pitches are driven connecting the two places every hundred feet. Every four hundred feet a slope and a jig are driven, at practically right angles to the ~~seam~~ gangway. From the slopes and jigs, breasts are driven fifty feet apart and these are connected up by means of pitches. This system of slopes, jigs, and breasts blocks out the coal into approximately rectangular pillars, of dimensions 84 feet by 34 ft, the places being driven 16 feet wide. On the gangways, much larger pillars are left for protection of the haulage way. The figure shows the ideal that is strived for, but due to local conditions, it is seldom, if ever, achieved. The timbering consists mainly of posts, for the roofs of the seams are excellent, but where it does happen to be "drummy" full sets are put in, five feet apart, the set consisting of three posts and a stringer. The timber used is about 8" diameter fire killed spruce. The system is practically the same in all the seams, the only exception being in the Carey

where the rooms are driven 12' wide instead of 16', thus increasing the size of the pillars. Tight work is entirely done with explosives, although the best miners pick-mine ahead on one rib thus giving them a free side to blast to. Explosives are also used in pillar work and no undercutting is done. In the Stewart and Morris seams the miners are paid on a tonnage basis with allowance for rock, and in the Carey they are paid on a yardage basis.

Fig.8. shows the system of blocking out pillars in vertical areas. The gangway is driven in the seam with its monkey 50' above, and are connected by vertical chutes. From the monkey angles are driven in the seam, pitching about 35°. These places are heavily timbered and the roof has to be tightly lagged. This diagram also shows the ideal which is strived for, and it, I may say, is never achieved.

The haulage in the mine is the largest cost item, and roughly speaking, for every miner there is one company man. Haulage on the gangways is done by compressed air locomotives, the gathering being done by horses. Each slope and jig requires a compressed air hoist, and two men, one as engineer and one as rope-rider. In spite of the complicated nature of the haulage accidents are not common, and in the two years I was there, only one man was killed in a haulage accident.

The mine is quite gassy, but not dusty. The gas seems to come from the measures rather than the coal seams, and Dr. Dowling in one of the reports expressed an opinion that it came from crushed out coal seams. The gas from the measures was also the source of gas in No.1. Mine. The mine is, of course, on a safety-lamp basis. Miners are equipped with both a safety-lamp and a cap

electric lamp. Haulage men, etc. use electric lamps entirely

The mine is very well ventilated; in fact it is conceded by miners to be the best ventilated mine in the west. One Sirroco fan, working on the blowing system, ventilates the mine. The efficiency is good, due to the building of concrete stoppages. Air is carried to the working faces by brattice curtains.

The mine is quite wet in places, and from the nature of the mine all the water has to be pumped to the surface. The cost of pumping is so great that it has paid the company to drain the surface water off in flumes. A small stream which flows over the mine has been ~~damned~~ dammed above the coal measures, the water piped over the mine and dropped into the river. This dam and pipe line cost in the neighbourhood of $10,000.00 but at one place alone has decreased the flow of water into the mine from over 70 gallons per min. to practically nothing, besides decreasing the flow materially at a number of other points. A large number of air pumps are required, besides a large steam pump at the main slope, and a large 4 stage centrifugal pump in the Stewart seam.

Surface Plant.

The surface plant for the mine is quite extensive. A new tipple was built in 1923, displacing the original one. The tipple has the capacity for 1200 tons in an 8 hour shift. A large Litchfield steam hoist hoists the coal to the surface in trips of 15 cars, each car having the capacity for 1.1/3 tons of coal. The trips are stopped on the first landing in the tipple and each car is weighed. Each car is then hoisted to the second landing by means of a creeper, where it is dumped. The slack coal (under 1") is separated out by a bar screen and the over size divided into three sizes on a Marcus screen. Part of the slack

coal goes to the briquet plant and the remainder is mixed with the larger sizes for Run-of-mine coal. Four sizes of coal can be shipped if desired, besides the Run-of-mine.

The Briquet plant was built last year and turns out a very good domestic briquet which ought to be in demand as a domestic fuel. The plant has a capacity of 20 tons per hour, and is so constructed that another unit can be added if desired. The plant uses the smallest of the slack coal, thus removing an objection to the coal which consumers have.

The power house is quite large. Electricity is generated by three units, two of which have each 250 K.V.A. capacity, and are driven by compound cylinder engines. The third is a 750 K.V.A. Turbo.generator, constructed by the General Electric Company. Four compressors are in use, two being low tension and two high tension. The former being used for rock machines and hoists, and the latter for the underground compressed air locomotives. The steam for the engines is derived from eight B. and W. return tubular boilers. These boilers are fired by hand with slack coal.

Other parts of the surface plant consist of; a well equipped machine shop, a lamp cabin, an office, a wash house, a large stable, and several store houses.

General.

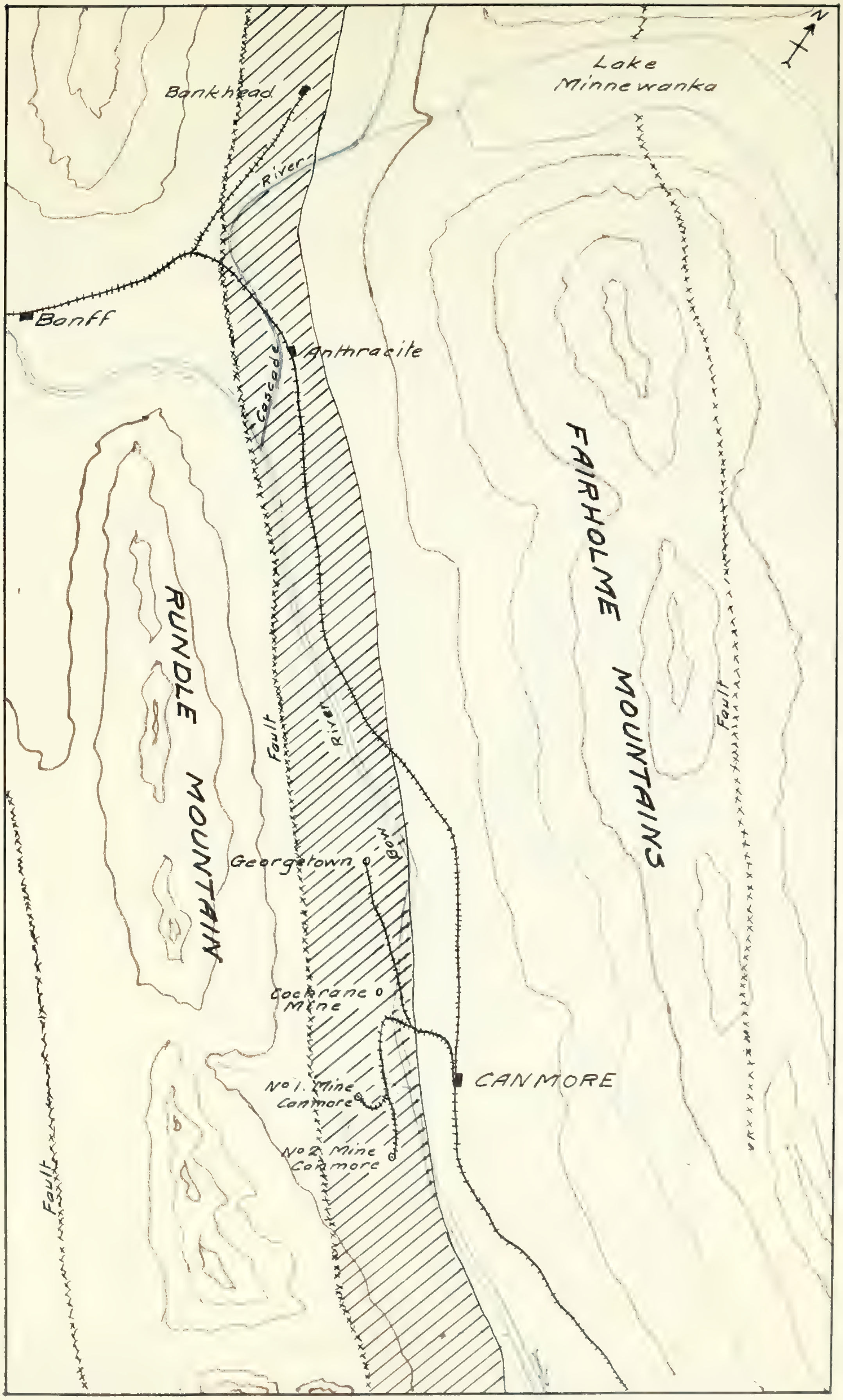
The mine produces about 900 to 1000 tons of coal per day, which can be disposed of by the surface plant in 8 hours. The coal is non-coking semi-bituminous, fairly clear of accidental impurities, low in intrinsic ash, sulphur, moisture and volatile and high in fixed carbon. The following is a general analysis;-

Moisture	1.7%
Sulphur	0.5%
Ash	7.4%
Volatile Matter	15.2%
Fixed carbon	75.7%
Calorific value per lb	14,120 B U.

Markets.

This mine has suffered like the other mines in the province for lack of markets for its product, during the past three years. In the past its greatest customer has been the Canadian Pacific Railway, but at present an effort is being made to sell the coal to other industries. The coal is essentially a steam coal, and hence has never been used for domestic purposes, except in the town. The briquets which are now being manufactured are intended for the domestic market.

CASCADE COAL BASIN


N
Lake Minnewanka
Bankhead
River
Banff
Anthracite
Cascade
FAIRHOLME MOUNTAINS
RUNDLE MOUNTAIN
Fault
River
Bow
Georgetown
Cochrane Mine
CANMORE
No 1. Mine Canmore
No 2. Mine Canmore
Fault
Fault

Showing the Kootenay Coal Measures.

Figure 1.

Cretaceous {
Upper Ribboned Sandstone
Kootenay Coal Measures
Lower Ribboned Sandstone

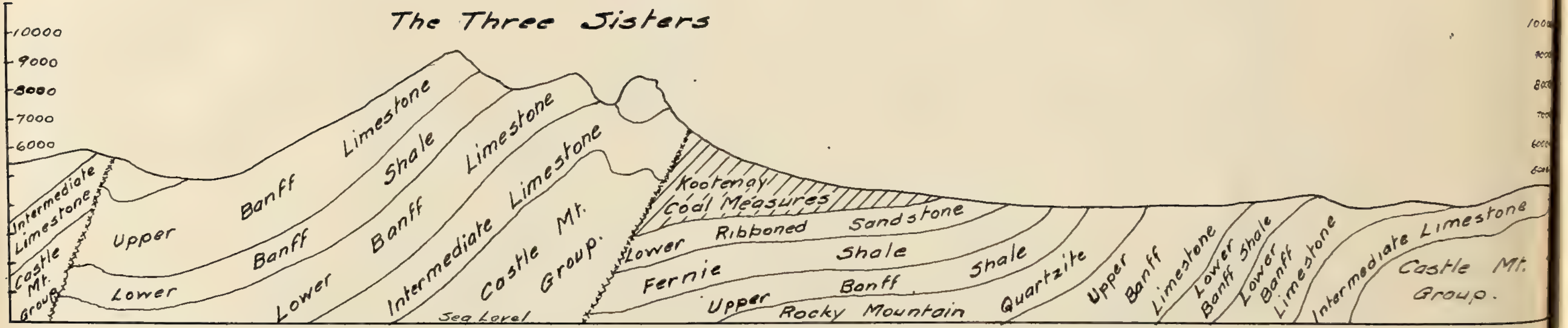
Jurassic — Fernie Shale

Lower Triassic — Upper Banff Shale

Carboniferous {
Rocky Mountain Quartzite (Pennsylvanian)
Upper Banff Limestone (Mississippian)
Lower Banff Shale Mississippian

Devonian {
Lower Banff Limestone
Intermediate Limestone

Cambrian — Castle Mountain Group.

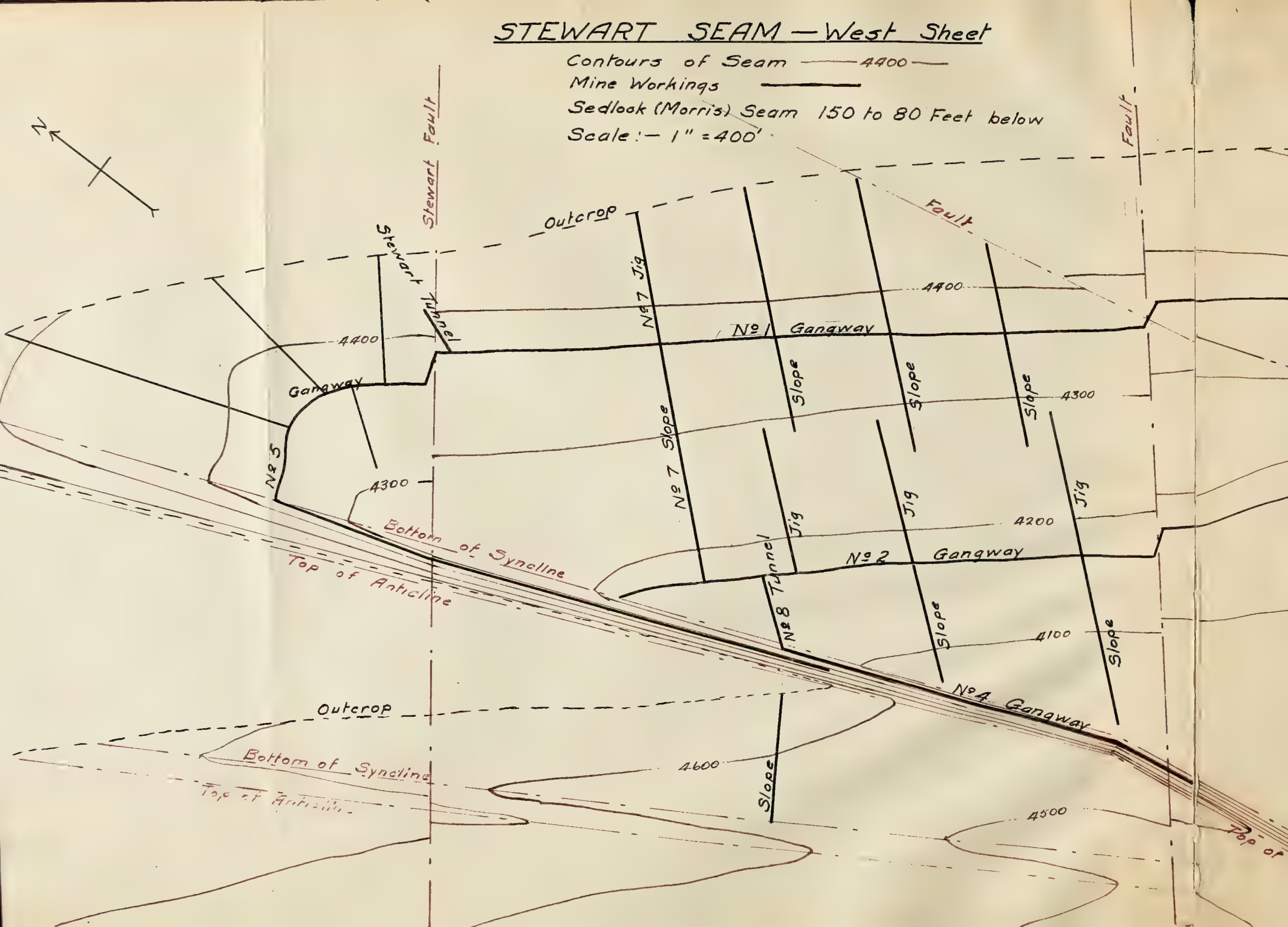

The Three Sisters
10000
9000
8000
7000
6000
Intermediate Limestone
Castle Mt. Group
Upper Banff Limestone
Shale
Lower Banff Limestone
Intermediate Limestone
Castle Mt. Group.
Sea Level
Kootenay Coal Measures
Lower Ribboned Sandstone
Fernie Shale
Upper Banff Shale
Upper Rocky Mountain Quartzite
Upper Banff Limestone
Lower Banff Shale
Lower Banff Limestone
Intermediate Limestone
Castle Mt. Group.

GEOLOGICAL CROSS SECTION OF CASCADE COAL BASIN

Figure 2.

STEWART SEAM — West Sheet

Contours of Seam ——4400——
Mine Workings ————
Sedlook (Morris) Seam 150 to 80 Feet below
Scale:— 1" = 400'


N
Stewart Fault
Fault
Fault
Outcrop
Stewart Tunnel
No 7 Jig
No 1 Gangway
4400
4400
Gangway
No 5
4300
4300
Slope
Slope
Slope
No 7 Slope
Jig
Jig
Jig
4200
No 2 Gangway
No 8 Tunnel
Bottom of Syncline
Top of Anticline
Slope
Slope
4100
No 4 Gangway
Outcrop
Bottom of Syncline
Top of Anticline
4600
Slope
4500
Top of

STEWART SEAM — East Sheet

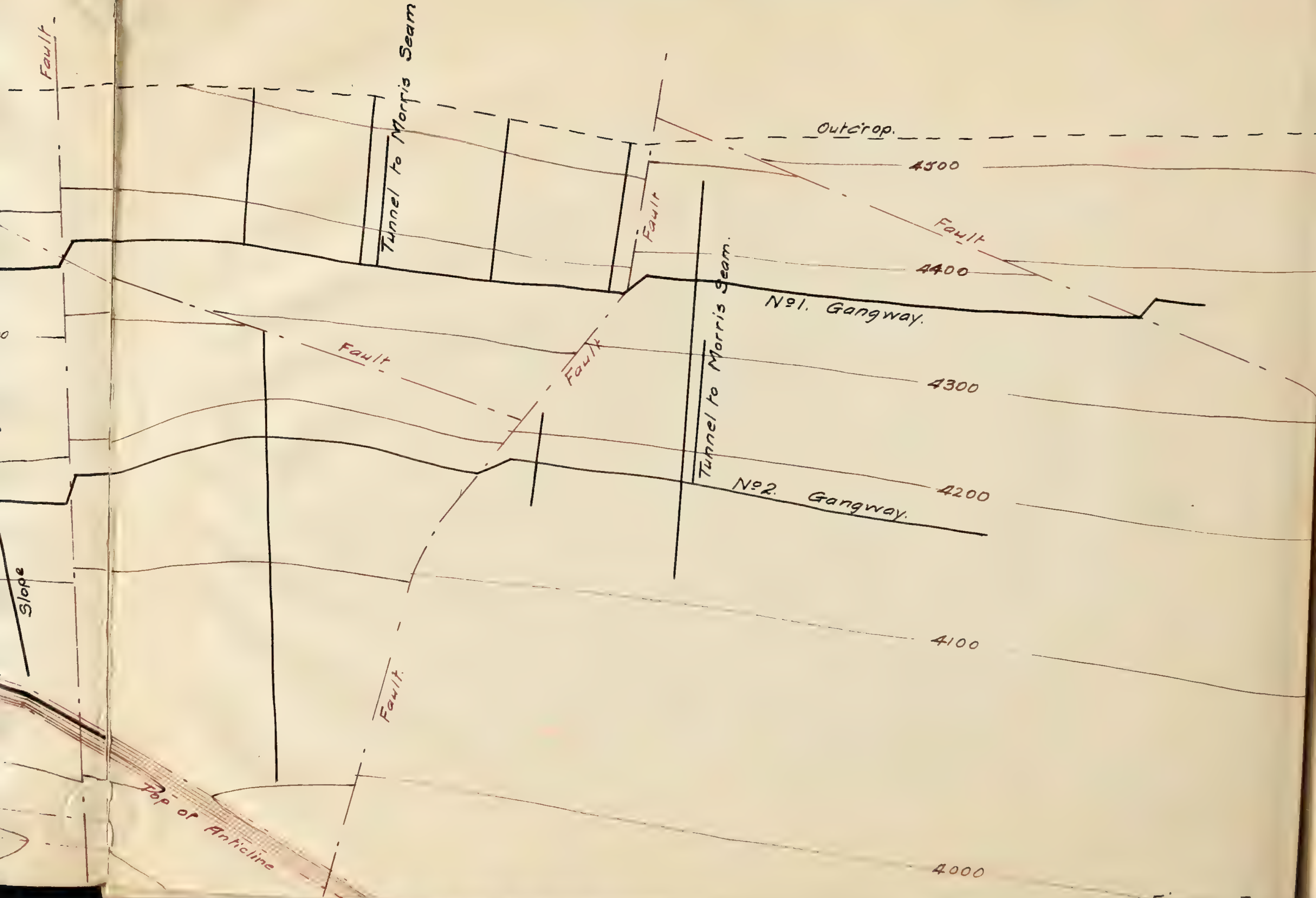

Fault
Tunnel to Morris Seam
Outcrop.
Fault
4500
Fault
Fault
4400
Nº1. Gangway.
Tunnel to Morris Seam.
Fault
Fault
4300
4200
Nº2. Gangway.
Slope
4100
Fault
Top of Anticline
4000

Figure 3.

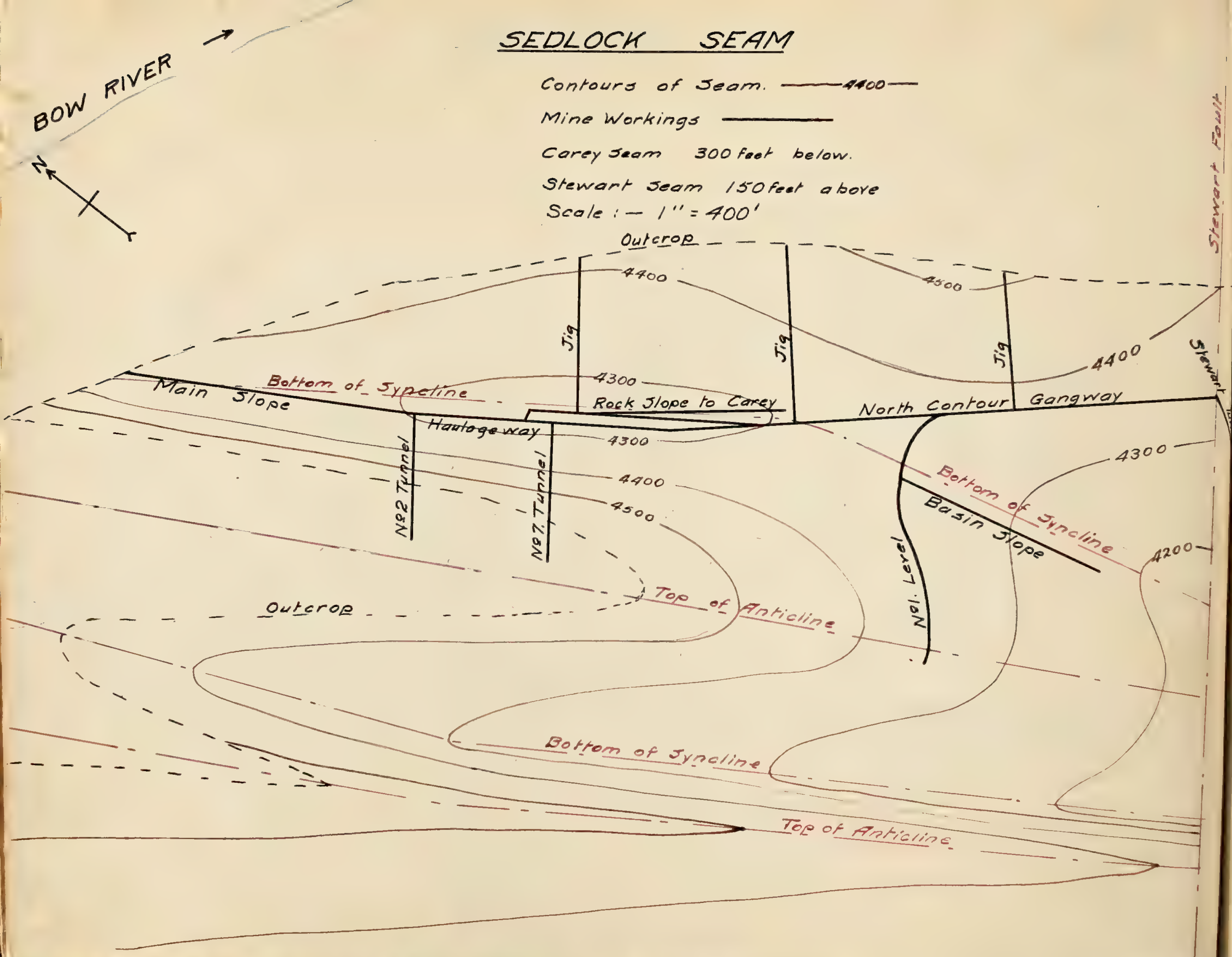

SEDLOCK SEAM
Contours of Seam. ——4400——
Mine Workings
Carey Seam 300 feet below.
Stewart Seam 150 feet above
Scale :— 1" = 400'
BOW RIVER
N
Outcrop
4400
4500
Jig
Jig
Jig
4400
Stewart Fault
Stewart
Bottom of Syncline
Main Slope
4300
Rock Slope to Carey
North Contour Gangway
Haulage way
4300
4400
4500
No2 Tunnel
No7 Tunnel
4300
Bottom of Syncline
Basin Slope
No1 Level
4200
Outcrop
Top of Anticline
Bottom of Syncline
Top of Anticline

Figure. 4

CAREY SEAM

Contours of Seam ——— 4000 ———

Mine Workings ————

Sedlock Seam 300 Feet above

Scale:— 1" = 400'

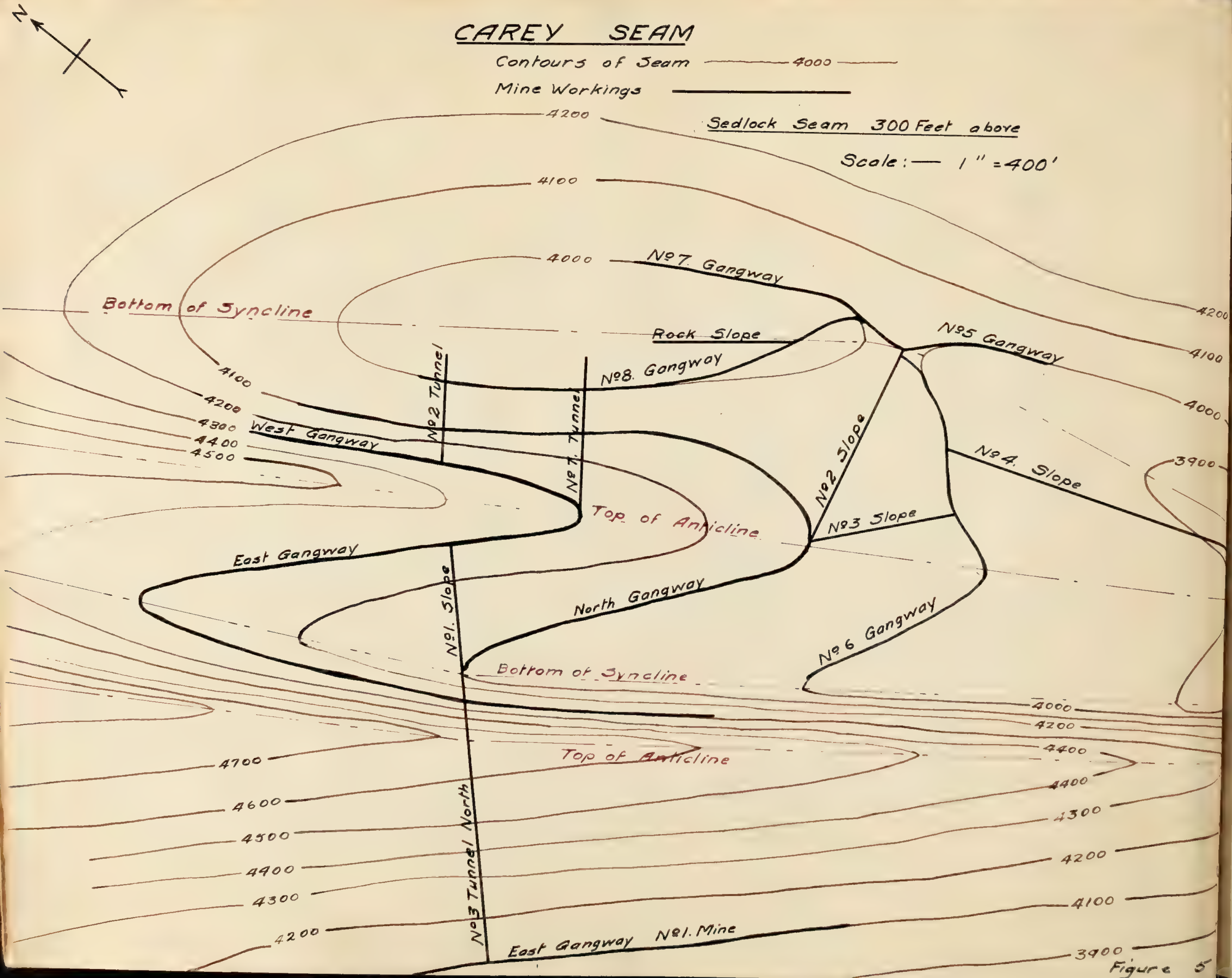
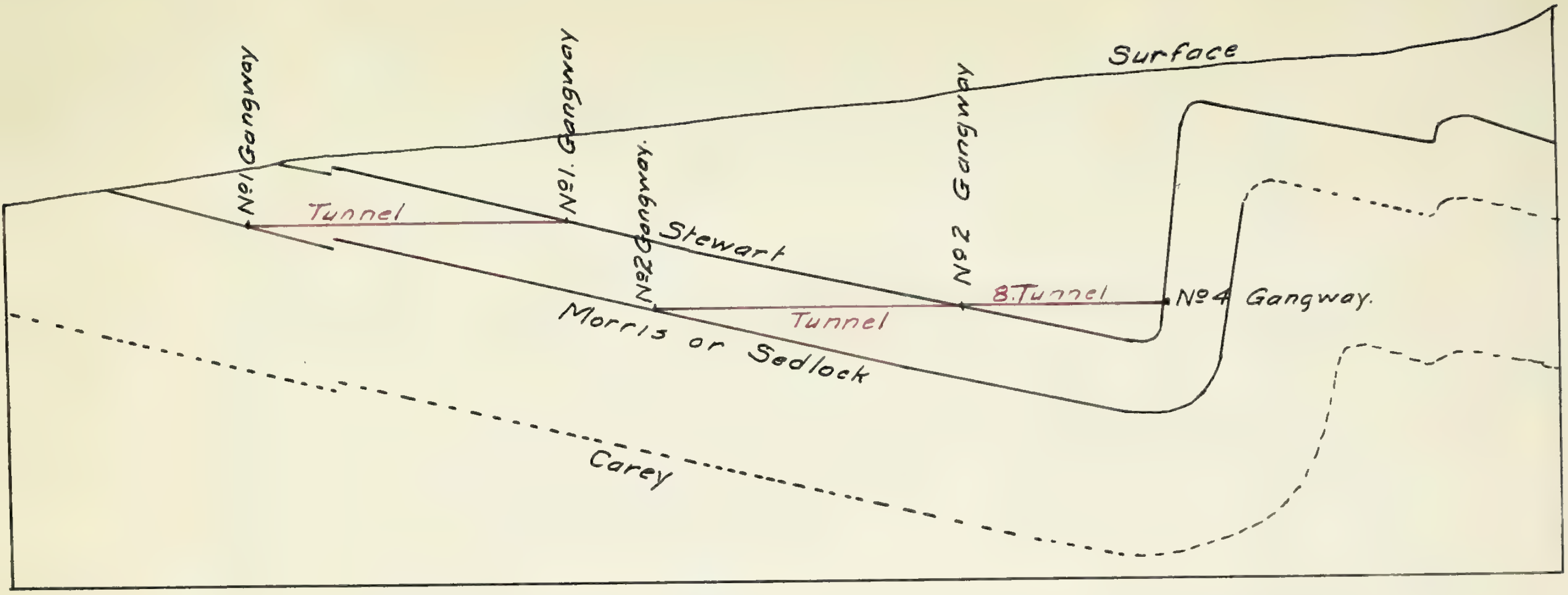

N
4200
4100
4000
3900
No 7. Gangway
Bottom of Syncline
Rock Slope
No 5 Gangway
No 8. Gangway
No 2 Tunnel
No 7. Tunnel
4100
4200
4300
4400
4500
West Gangway
No 2 Slope
No 4. Slope
No 3 Slope
Top of Anticline
East Gangway
North Gangway
No 1. Slope
No 6 Gangway
Bottom of Syncline
4000
4200
4400
Top of Anticline
4700
4400
4600
4300
4500
4200
4400
4100
4300
4200
3900
No 3 Tunnel North
East Gangway
No 1. Mine

Figure 5

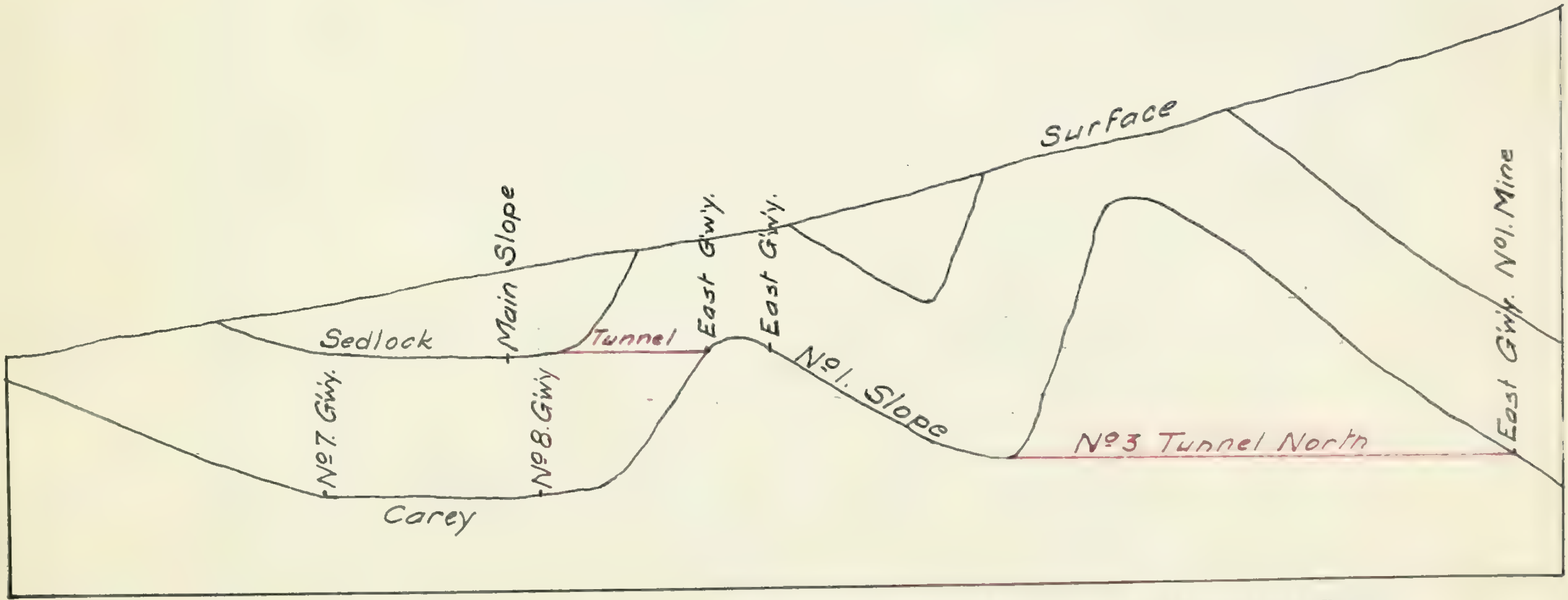
VERTICAL SECTION


Surface
Nº1 Gangway
Tunnel
Nº1. Gangway
Nº2 Gangway.
Stewart
Nº2 Gangway
8.Tunnel
Nº4 Gangway.
Tunnel
Morris or Sedlock
Carey

STEWART AND MORRIS WORKINGS

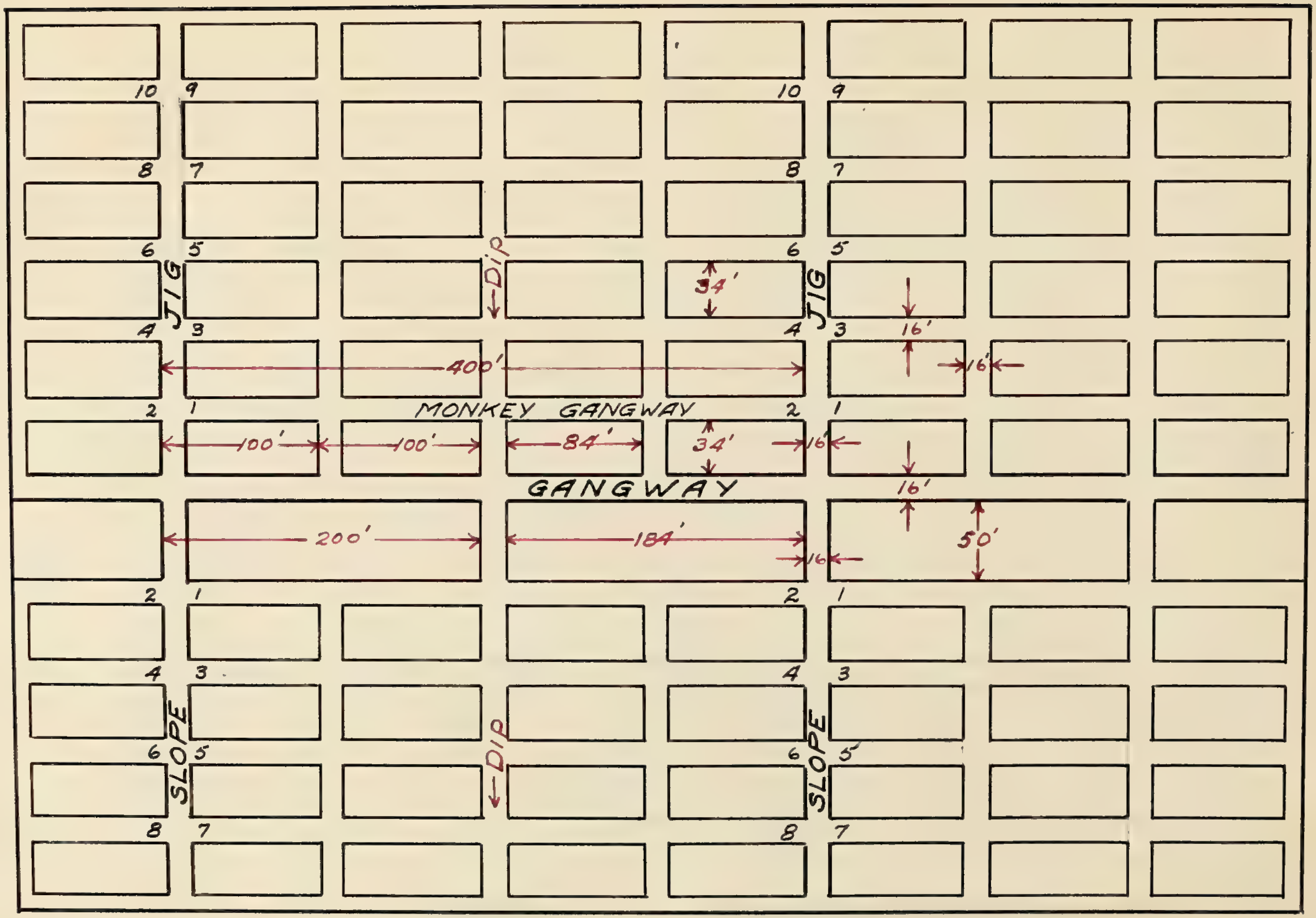
Scale:– 1" = 400'

VERTICAL SECTION


Surface
Sedlock
Main Slope
Tunnel
East Gw'y.
East Gw'y.
Nº1. Slope
Nº7. Gw'y.
Nº8. Gw'y
Carey
Nº3 Tunnel North
East Gw'y. Nº1. Mine

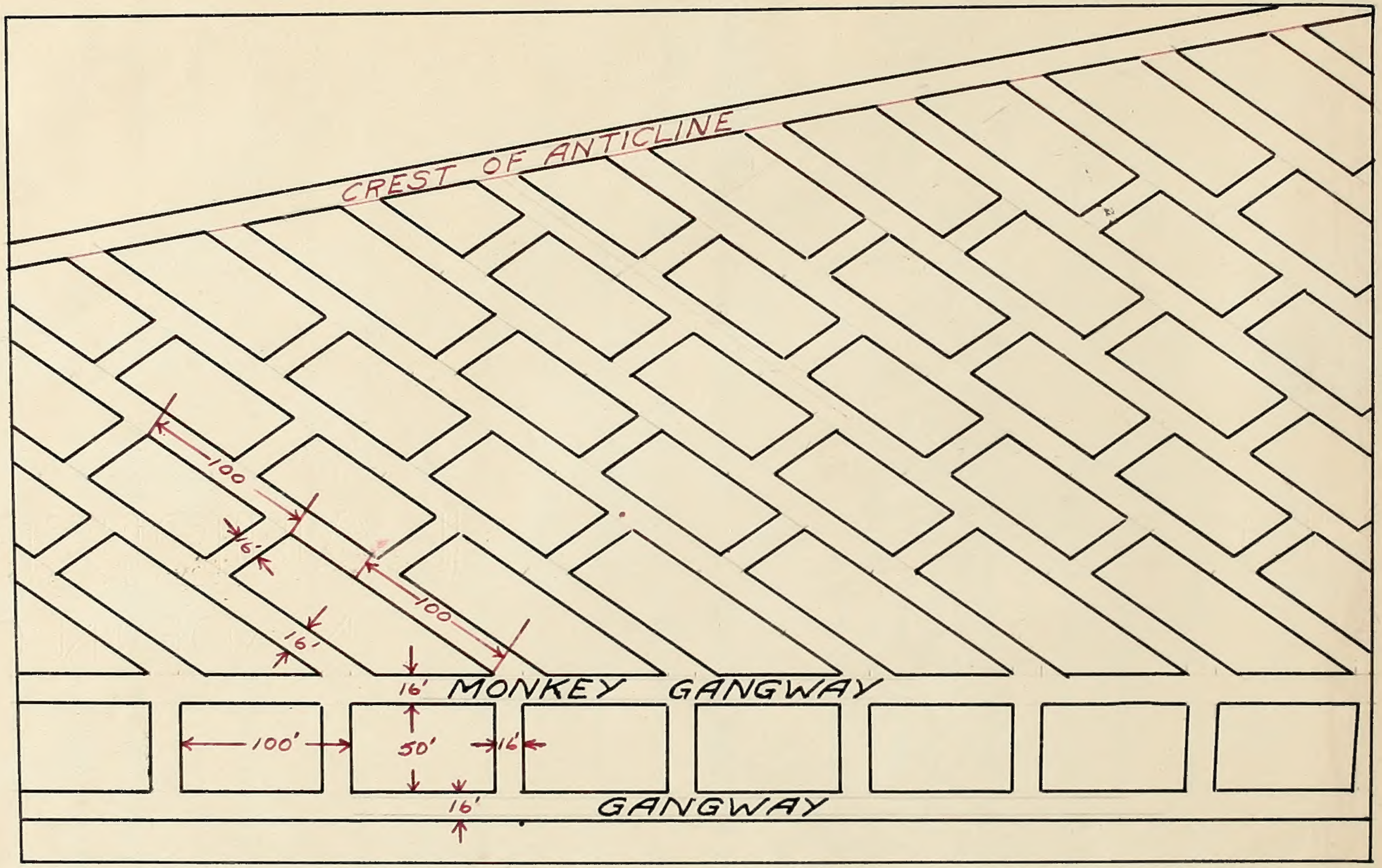
SEDLOCK AND CAREY WORKINGS

Scale:– 1" = 400'


10
9
10
9
8
7
8
7
6
5
6
5
JIG
JIG
DIP
34'
16'
4
3
4
3
400'
16'
MONKEY GANGWAY
2
1
2
1
100'
100'
84'
34'
16'
GANGWAY
16'
200'
184'
16'
50'
2
1
2
1
4
3
4
3
SLOPE
DIP
SLOPE
6
5
6
5
8
7
8
7

SYSTEM OF MINING
SEAM DIPPING FROM 5° TO 25°

Figure. 7.


CREST OF ANTICLINE
100
16'
100
16'
16'
MONKEY GANGWAY
100'
50'
16'
16'
GANGWAY

VERTICAL WORKINGS

Figure 8